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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/901,526	07/09/2001	Matthias Forster	INF-1078	7099

7590

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EXAMINER

MULPURI, SAVITRI

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 11/07/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/901,526

Applicant(s)

Forster et al

Examiner

Savitri Mulpuri

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on IDS filed on 2/27/02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 7 6) ☐ Other:

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DETAILED ACTION

This communication is in response to the applicant's submission of IS filed on 2/27/02.

Claim Rejections - 35 USC § 102

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-4, 6-8, 11 are rejected under 35 U.S.C. 102(a) as being anticipated by Lin et al US 6,037,219.

Lin et al teaches forming hemispherical grains (HSG) on the surface of the silicon substrate at a temperature in the range of 550 C to 580 C at a pressure less than 1 torr in silane diluted with nitrogen ambient. Lin et al also teach exposing surface of the substrate with HF vapor cleaning prior to HSG growth. (See fig. 8 and col. 6, lines 36-48).

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-8, 10, 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Lin et al US 6,127,221.

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Lin et al et al teaches cleaning of surface of silicon with HF vapor and then forming hemispherical grains (HSG) on the surface of the silicon material directly from silane and nitrogen at temperature in the range of 500 C to 800 C at pressure less than 1 torr for a time period of 1 min to 60 minutes. Lin et al further disclose silane concentration of 10 E-3 moles / m³ in nitrogen ambient, which imply that nitrogen content is more compared with silane (see fig. 5 spacious hemispherical grains and col. 5, lines 1-18)

Claims 1-4, 6-8 , 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Madhukar et al ,US 6344,403.

Madhukar et al teaches forming dielectric layer on a surface of a silicon substrate; growing nuclei and nanoclusters with hemispherical shape by providing silane or disilane along with co-flow gases such as hydrogen or nitrogen in either LPCVD or UHVCVD at a partial pressure less than 200m torr and a temperature less than 600 C(see fig. 6 and 7 and fig. 8,9 and 10; fig. 21 and 22 and col. 11, lines 53-67; col. 12, lines 1-11; col. 20, lines 25-64). Madhukar et al teaches cleaning the substrate by HF prior to hemispherical growth(see col.9, lines 45-67). Inherently chamber pressure in Madhukar is within the range of Instantly claimed pressure because Madhukar et al teaches wide choice of pressure by growing the hemispheres in either LPCVD or UHVCVD.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madhukar et al.

Madhukar et al do not teach the ratio of hydrogen to silane or nitrogen to silane to form hemispherical grains. Though, Madhukar et al teach nucleation is about one minute but not teach the time to form nanoclusters. However, broadly disclose nanocluster formation depends on so many factors such as nature of the surface of the dielectric layer or partial pressure of silane or

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flow rate of silane chamber temperature and content of the co-flow gases such as hydrogen or nitrogen. It would have been obvious to one of ordinary skill in the art to maintain time for hemispherical growth and hydrogen to silane or nitrogen to silane depends on the desired size such as diameter of the hemisphere grain and distance of separation between grains for particular purposes such as capacitor in DRAMs or gate in EPROMs.


Claims 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (the two applied references) or Madhukar et al in combination with Yew et al US 5753559.

None of the references teach dilution ratio of silane with hydrogen. Yew et al teaches the ratio of hydrogen to silane is 98 percent(see abstract and col. 7, lines 40-56. It would have been obvious to one of ordinary skill in the art to use heavy dilution of silane with hydrogen for hemispherical growth.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Prior art teaches growing hemispherical grains..Watanabe discloses how variable amount of hydrogen by dissociation of silane, not as dilutant gas or co-flow gas, produces variation in the hemispherical growth. (See 3B and 4B.)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Mulpuri whose telephone number is 305-5184. The fax phone number for the organization where this application or proceeding is assigned is 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-0956.


SAVITRI MULPURI
PRIMARY EXAMINER